

# Comprehensive Review of Jalaukavacharan-Leech Therapy in Purview of Ayurveda

Priti Engineer<sup>1</sup>, Dhaval Makwana<sup>2</sup>, Amisha Dabhi<sup>3</sup>, Hardik Chudasama<sup>4</sup>

<sup>1</sup>Assistant Professor, Shalya Tantra Department, S.H. Ayurveda College, Surendrangar, Gujarat, India

<sup>2</sup>Assistant Professor, Ayurved Samhita & Siddhanta Department,

Indian Institute Ayurveda Research, Ishwariya-Rajkot, Gujarat, India

<sup>3</sup>PG Scholar, Ayurved Samhita & Siddhanta Department, National Institute of Ayurveda, Jaipur, Rajasthan, India

<sup>4</sup>Ph.D Scholar, Kriya Sharir Department, National Institute of Ayurveda, Jaipur, Rajasthan, India

## ABSTRACT

The fundamental approach of Ayurveda therapy is founded on two principles, namely *Shodhan chikitsa* (Therapy of Elimination) and *Shaman chikitsa* (Internal Medicine). The therapeutic approach of *Shodhan Chikitsa* involves the implementation of a set of five purificatory procedures, commonly referred to as *Panchakarma*. The inclusion of *Raktamokshana* in *Panchakarma* by *Acharya Susruta* has been described as the most effective procedure due to its ability to eliminate all three vitiated *Doshas*, namely *Vata*, *Pitta*, and *Kapha*. *Jalaukavacharana* is a form of *Raktamokshana*, a therapeutic practice involving the removal of blood from the body, which employs the use of leeches. The utilization of leeches for *Raktamokshana* is widely regarded as the most efficacious and distinctive approach, as it entails the elimination of vitiated *Doshas* from the body without the use of any incisive instruments. Consequently, *Raktamokshana* via leeches is classified as an *Ashastra* modality. This paper discusses the fundamental principles of Leech therapy and the technique employed for *Raktamokshana* through the use of leeches.

**KEYWORDS:** *Jalaukavacharan, Raktamokshan, Leech therapy, Hirudo therapy, Blood-letting, Ayurveda*

## INTRODUCTION

As per Ayurvedic principles, the fundamental aetiology of all ailments is the imbalance of the three *Doshas*, namely *Vata*, *Pitta*, and *Kapha*. The Ayurvedic definition of health emphasises the balance of the *Doshas*, *Agni*, *Dhatu*, and *Mala*. Consequently, the fundamental approach to Ayurvedic treatment is founded upon two principles, namely *Shodhan chikitsa* (Elimination Therapy) and *Shaman chikitsa* (Internal medicine). The *Shaman chikitsa* and *Shodhan chikitsa* are two distinct therapeutic modalities in Ayurveda. The former involves the internal administration of herbo-mineral medicines to restore balance to the vitiated *Doshas*, while the latter employs *Panchakarma* techniques to expel the vitiated *Doshas* from the body. The *Panchakarmas*, as per the teachings of *Acharya Sushruta*, comprise of five therapeutic procedures, namely *Vamana* (induced vomiting), *Virechana* (purgation), *Basti* (medicated

enema), *Nasya* (nasal medication), and *Raktamokshana* (bloodletting). Of the five procedures considered, *Acharya Sushruta* has identified *Raktamokshana* as the optimal method due to its ability to effectively eliminate all three vitiated *Doshas*, namely *Vata*, *Pitta*, and *Kapha*. There exist three primary techniques for *Raktamokshana*, namely *Siravedh*, *Jalaukavacharana*, and *Prachhan karma*. *Siravedh* involves bloodletting through the superficial veins using a simple scalp-vein cannula. *Jalaukavacharana* entails the use of leeches, while *Prachhan karma* involves making multiple incisions on a specific site. Distinct instruments are employed for bloodletting based on the *Dosha* type. One of the traditional Ayurveda treatments for *Vata dosha* involves the practise of *shranga*, which involves the use of an animal horn to extract blood. Two traditional Ayurvedic treatments for imbalances in the

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body are *Jalauka* therapy, which involves the use of leeches to address *Pitta dosha*, and *Alabu* therapy, which entails the removal of excess blood through the use of an empty, dried bottle gourd or *Ghatiyantra* to address *Kapha dosha*. *Jalaukavacharana* represents a distinctive approach to the practise of *Raktamokshana*. This falls under the category of *Raktamokshana* known as *Ashastra*. Furthermore, *Jalauka* has been delineated by *Acharya Sushruta* as a type of *Anushastra*, which pertains to para-surgical techniques. Leeches possess segmented anatomies similar to earthworms, and exhibit dual suckers located at both the caudal (posterior) and rostral (anterior) ends. The anterior region of the organism features a tripartite set of mandibles that are capable of penetrating the epidermis of the host in order to extract their blood, resulting in a distinctive wound pattern resembling the shape of the letter 'Y'. There exist two distinct species of medicinal leeches that are utilised for therapeutic purposes, namely *Hirudo medicinalis* and *Hirudo mychaelseni*. The utilisation of *Hirudo medicinalis*, a member of Phylum Annelida and class Hirudinea, for the purpose of bloodletting is a common practise in India. The leeches in question exhibit a dark brown hue and are characterised by the presence of six longitudinal stripes that traverse the length of their body. The physical characteristics of these organisms include a length of 2 to 3 inches, a convex shape, and transverse wrinkles. Additionally, their bodies taper at both ends. During the feeding process, it has the capacity to ingest approximately 5 to 15 millilitres of blood. The saliva of the organism in question comprises a variety of bioactive compounds, such as anticoagulants, anaesthetics, vasodilators, and prostaglandins. Hirudin, a highly effective anticoagulant, functions by impeding the conversion of fibrinogen to fibrin, thereby hindering the process of blood coagulation.

## Material and Methods

The entirety of the data utilized in this investigation was obtained from Classical Ayurvedic literature and peer reviewed articles.

## Definition

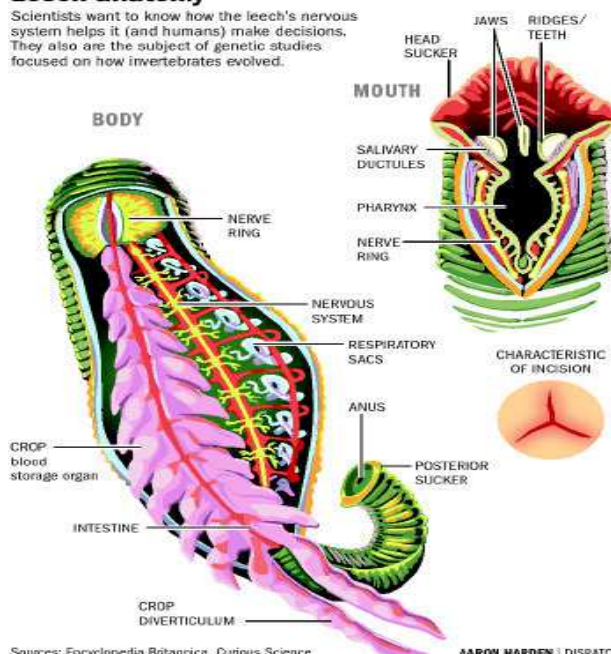
The etymology of the term "leech" can be traced back to the Old English word "laece," which denoted a medical practitioner. During the mediaeval period in England, the association between leeches and therapeutic practices was established due to the etymological origins of the term.<sup>[1]</sup> According to Ayurvedic compendiums, leeches are referred to as *Jalauka* due to their reliance on water as the foundation of their existence, habitat, and sustenance.<sup>[2]</sup>

## Contemporary view of Leech Anatomy and physiology:

The overall anatomical structure of medicinal leeches conforms to that of the majority of other leech species. Adults that have reached full maturity can measure up to 20 centimeters in length. Their coloration typically consists of shades of green, brown, or greenish-brown, with a darker hue on the dorsal side and a lighter hue on the ventral side. The thin red stripe is also present on the dorsal side. The aforementioned organisms possess a pair of suckers, situated at opposite extremities, denoted as the anterior and posterior suckers. The posterior region of the organism is primarily utilized for leverage, while the anterior sucker, which comprises the jaw and teeth, is the site of feeding. Medicinal leeches possess tripartite jaws that bear a striking resemblance to saws, featuring around 100 sharp edges that are utilized to incise the host. The resulting scar from the surgical procedure takes the form of an inverted Y shape enclosed within a circular boundary. Upon penetrating the dermis, they proceed to extract blood while simultaneously administering anticoagulant agents, specifically hirudin.<sup>[3]</sup> Adults of considerable size have the capacity to ingest a quantity of food that is equivalent to ten times their body mass in a solitary feeding event, with an average intake of 5-15 mL.<sup>[4]</sup> Hermaphroditic medicinal leeches engage in sexual reproduction by laying clutches of up to 50 eggs in shaded and humid environments near water bodies. Research conducted in Poland has revealed that medicinal leeches occasionally reproduce within the nests of sizable aquatic avian species. The study suggests that conservation initiatives aimed at preserving bird habitats could potentially have an ancillary effect of safeguarding declining leech populations.<sup>[5]</sup>

### Leech anatomy

Scientists want to know how the leech's nervous system helps it (and humans) make decisions. They also are the subject of genetic studies focused on how invertebrates evolved.



### Types of *Jalauka* (Leeches)

*Jalaukas* can be broadly classified into two distinct categories. The species *Hirudo detrimental* is considered to be poisonous, commonly known as *Savisha Jaloka*. *Hirudo medicinalis*, commonly known as medicinal leech, is a non-poisonous species also referred to as *Nirvisha Jaloka* in Ayurveda Classics.<sup>[6]</sup>

#### Savisha (Poisonous Leeches):

Leeches are generated from the decomposition of toxic fish, insects, worms, frogs, and other organisms, and reside in unsanitary aquatic environments, such as those contaminated with urine, excrement, and putrefying cadavers. The specimens in question exhibit a range of hues including red, white, and black, possess a high level of physical activity, display both robust and slender body types, and feature a diverse array of iridescent markings on their dorsal surface. They ought to be declined.<sup>[7]</sup> There exist six types of *Jalaukas* that are considered poisonous, known as *Savisha Jalaukas*. Krishna is described as having a dark complexion, resembling the colour of Anjana powder (Antimony). Additionally, he is said to have a large head. The object being investigated identified as *Karbura* exhibits a grey coloration along with possesses a broad body structure akin to that of *Varmimatsya*, a type of fish. Notably, the abdomen of this *Jalauka* is segmented and appears to be bulging. The *Alagarda* exhibits hirsute characteristics with prominent lateral regions and a dark oral cavity. The *Indrayudha* species exhibits distinctive stripes on their dorsal region. *Samudraka* is a type of *Jalauka* that exhibits a blackish yellow coloration and displays intricate floral patterns on its body. The *Gochandana* specimen exhibits a bifurcated lower region resembling the scrotum of a bull, accompanied by a diminutive oral aperture. The bite of these six different types of leeches can result in various symptoms such as significant swelling, intense itching, fainting, fever, a burning sensation, vomiting, toxicity, and weakness.

#### Nirvisha (Non-poisonous Leeches):

*Jalauka* that originate in unpolluted water sources are considered non-toxic (*Nirvisha*). The *Jalauka* in inquire about have a bluish-black hue reminiscent of algae, possess a spindle-shaped physique, and feature a dark dorsal region juxtaposed with a yellowish ventral surface.<sup>[8]</sup> These creatures possess formidable strength, exhibit a ravenous appetite, and consume blood with remarkable speed. The aforementioned flora, namely putrefied (decayed), *Padma* (Lotus), *Utpala* (White lotus), *Nallina* (slight red lotus),

*Kumuda* (lily), *Saygandhika* (highly fragrant lily), *Kuvalaya* (red lily), *Pundanke* (very white lotus), and *Saivata* (algae), serve as the birthplace for them. There exist six species of non-poisonous leeches known as *Nirvisha Jalaukas*. *Kapila* is characterised by a dark brown hue with reddish flanks resembling *Manashila*. The back of *Kapila* is oily and has a slightly greenish colour similar to *Mudga*. The organism known as *Pingala* exhibits a reddish-brown coloration and possesses a circular body morphology, displaying rapid locomotion. The *Shanku Mukhi* species is characterised by a brown coloration resembling that of liver, a rapid blood-sucking ability, and a long, pointed mouth structure. The *Mushika* species is characterised by its brown coloration and physical resemblance to mice, albeit with an unpleasant odour. *Pundarikamukhi* is characterised by a greenish hue akin to that of *Mudga*, and a wide aperture reminiscent of the lotus flower. *Savarika* is a reddish-pink coloured substance, possessing an oily texture and measuring eighteen *angula* (equivalent to 36 cms.) in length. It is commonly employed for the treatment of cattle.

#### Cultivation of *Jaluka* (leeches)

The optimal time to collect leeches is during the autumn or rainy season. The organisms are typically obtained from bodies of water that contain lotus and spirogyra. They are then placed in a container with moist leather or meat and kept in fresh water, often in a large jar. The diet of these organisms consists of algae, powdered dried meat from aquatic animals, and tubers. The act of adding straw and aquatic plants to the jars is a method used to establish a suitable habitat. It is recommended to change the water and food materials in the pot every three days. Additionally, it is advised to transfer the leeches to another pot every seven days.<sup>[9]</sup> Leeches with a large abdomen, dull appearance, substantial width, sluggish movement, non-biting behaviour, minimal blood consumption and poisonous nature are not recommended.

#### Indications of *Jalaukavacharana*

In recent times, there has been a global conduction of diverse clinical and experimental studies aimed at assessing the effectiveness of leech therapy in treating various medical conditions.<sup>[10]</sup>

The use of *jalauka* has listed several medical conditions, including *Gulma* (abdominal lump), *Arsha* (piles), *Vidradhi* (abscess), *Kustha* (skin diseases), *Vatarakta* (gouty arthritis), *Galroga* (throat disorders), *Netraroga* (eye disorders), and *Visarpa* (erysipelas).<sup>[11]</sup>



**Table No.1 Indications other than classics:**

Sr. No.	Disease	Indication
1.	Diabetic foot ulcer	The effectiveness of leech application in managing diabetic foot ulcers is notable. <sup>[12]</sup>
2.	Diabetic peripheral neuropathy	Study shows significant result in diabetic peripheral neuropathy through the leech therapy. <sup>[13]</sup>
3.	Eczema (Vicharchika)	The effectiveness of <i>Jalaukavacharan</i> in treating <i>Vicharchika</i> has been demonstrated through empirical research. <sup>[14]</sup>
4.	Gout (Vatarakta)	The application of leeches has demonstrated efficacy in alleviating symptoms such as pain, swelling, and erythema associated with acute gout. <sup>[15]</sup>
5.	Haemorrhoids	<i>Jalaukavacharana</i> is a great alternative for thrombosed haemorrhoids. Bdelein in leech saliva reduces inflammation and preserves circulation, restoring bluish-black discolouration. Leech saliva anaesthetic relieves pain and discomfort. <sup>[16]</sup>
6.	Non healing ulcer	The utilisation of leech therapy has been demonstrated to be efficacious in the alleviation of pain and acceleration of the healing process in the treatment of non-healing ulcers. <sup>[17]</sup>
7.	Osteoarthritis	Leech therapy reduces knee osteoarthritis pain quickly and safely. <sup>[18] [19] [20]</sup>
8.	Peripheral vascular diseases	According to available information, leech therapy has been found to be effective in managing Burger's disease. This is because it can help to alleviate inflammation and thrombosis. The effectiveness of this treatment extends to other conditions affecting the peripheral vascular system. <sup>[21] [22]</sup>
9.	Reconstructive plastic surgery	Leech therapy is a traditional treatment that is both safe and cost-effective. It is commonly employed in reconstructive plastic surgery to salvage reattached body parts and flaps, particularly in instances where blood circulatory issues are present. <sup>[23]</sup>
10.	Reconstructive surgery	Leeches are being utilised by reconstructive surgeons to eliminate stagnant blood from a flap or reattached limb. In 1995, medicinal leeches were utilised to successfully reattach the ear of a five-year-old boy. Leeches have been utilised extensively for the purpose of reducing venous congestion in various body parts such as fingers, toes, ears, scalp, limbs, or other reattachments and replants following traumatic amputation. <sup>[24] [25]</sup>
11.	Venous disease and varicose veins	The utilisation of leech therapy has demonstrated efficacy in the management of complex cases of varicose veins, resulting in a reduction of both oedema and hyperpigmentation. <sup>[26]</sup>

**Contraindications of Leech Therapy (*Jalaukavacharana*)**

It is not recommended to apply leeches directly over large, prominent veins or to sensitive areas such as the eyelids, breasts, or genital organs. It is important to exercise caution when utilising leeches in paediatric patients due to the potential for severe or prolonged bleeding. It is not recommended to apply leeches during midday, evening or night as it can result in complications like haemorrhage. Leech therapy has certain contraindications that must be taken into consideration. <sup>[27]</sup> Patients who are immunocompromised or taking anticoagulants, those who have endoprostheses, anaemia, diabetes, or an allergy to leeches, as well as those with bleeding disorders such as haemophilia and arterial insufficiency should avoid this therapy. The application of them is not recommended during pregnancy. <sup>[28]</sup>

**Method of *Jalaukavacharana******Purva Karma* (before procedure): <sup>[29]</sup>**

**A. Preparation of Patient:** Initially, the individual is chosen and a comprehensive evaluation of their overall well-being follows. It is imperative to exclude any contraindicated conditions. The optimal time for the application of leeches is in the morning. Leeches are administered to patients in either a seated or supine position, with the intention of comfortably exposing the affected area. Prior to the application of leeches, patients are administered with oil and/or sweating treatments based on their individual conditions. It is recommended that *Snehan*, not be performed immediately before the application of leeches. However, a mild

*Swedan* treatment may be administered to the bloodletting site half an hour prior to the procedure. The preferred location is adequately cleansed with water at a cool temperature.

- B. Preparation of leeches:** Prior to application, leeches are coated with a mixture of mustard and turmeric paste, which serves as an antiseptic and enhances their hunger and hematophagy. Prior to usage, the disinfected leeches are immersed in a jar of fresh water for a duration of thirty minutes. It is recommended to refrain from using disinfectants or soap during this process.

***Pradhana karma* (main procedure):** <sup>[30]</sup>

The intended location is sanitised using dampened gauze. To extract the leech, it is necessary to remove it from its container and grasp it by its cervical region using one's fingers. The oral aperture is positioned with accuracy in proximity to the impacted area. To safely detach a leech, it is recommended to firmly grasp its posterior end until the point at which it initiates blood-feeding, after which it can be cautiously disengaged. Upon initiating the act of blood consumption, the creature in question elevates its neck and assumes a horseshoe-like shape. The number of leeches applied is determined by the specific need, typically ranging from 5 to 10. After the commencement of blood-sucking, leeches are typically enshrouded with damp gauze and intermittently subjected to a stream of cold water from overhead, with the aim of ensuring the leech's comfort throughout the process. In cases where a leech exhibits reluctance to initiate feeding, it may be necessary to employ a small amount of milk or ghee or to induce bleeding via a prick in order to facilitate the process of suction. Upon reaching complete satiation, the leech disengages from the host's skin and descends to the ground. Initially, the *Jalauka* solely extracts the contaminated blood. The sensation of pruritus or a stinging sensation at the point of application is indicative of the commencement of hematophagy by the leech, wherein it is consuming uncontaminated blood. The removal of a leech is necessary when it is utilised for the purpose of extracting pure blood. In the event that the leech does not detach, it is recommended to apply a small amount of turmeric powder or common salt powder onto the area where it is attached. Typically, leeches have the capacity to ingest approximately 5 to 10 millilitres of blood.

**Precaution:**

Precautionary measures should be taken when using leeches, as they should not be applied to major veins such as the Femoral or Jugular veins, nor to delicate areas such as the Breast, Penis, or Eye lids. It is recommended to store utilised leeches in individual containers.

***Paschata karma* (after procedure):** <sup>[31]</sup>

- A. Patient care:** Following the extraction of the leech, it is recommended to permit the wound to undergo a brief period of homeostasis, allowing for the natural flow of blood. The site undergoes cleansing with either Savlon or normal saline solution. The application of Turmeric powder or *Satadhauta ghritha*, a traditional Ayurvedic herbal ghee preparation, can be utilised to facilitate the process of healing. Subsequent to the injury, a gentle bandage is applied for a duration of 6 to 12 hours to halt the bleeding. In the event that the seepage from the wound persists, it may be contained with the aid of tincture benzene. The patient may be provided with small quantities of lime water, soup, or glucose water.
- B. Leech care:** Following detachment, it is recommended to induce emesis in leeches. The application of turmeric powder at the oral cavity is performed. Proper emesis necessitates the gentle squeezing of the anterior sucker to facilitate the release of blood, starting from the caudal end and moving towards the front end. The leech's activity upon immersion in water serves as an indicator of the efficacy of the vomiting process. The utilised leeches are stored in distinct containers denoted with the pertinent information of the corresponding recipient. It is recommended to apply the leech once per week and to reserve a single leech for each patient in order to prevent the spread of infection between individuals.

**Mode of action of *jalaaukavacharan*:**

Leeches function by releasing bioactive compounds through their salivary secretions. The saliva comprises numerous components, approximately one hundred, that encompass an antiplatelet aggregation factor, anaesthetic, and anti-inflammatory and antibiotic agents. The saliva of leeches is known to possess hirudin, an anticoagulant that effectively halts the process of blood clotting and facilitates the dissolution of thrombi. This mechanism proves beneficial in the clearance of both partial and complete blockages in distal arteries. Upon biting, leeches release certain chemicals in their saliva that have the ability to dilate the blood vessels of their hosts and reduce the viscosity of their blood. The act of secreting a local anaesthetic by leeches has the effect of masking any pain that may be caused by their bite, thereby rendering their hosts unaware of their presence. Leeches are known to promote healing and reduce tissue swelling by consuming excessive amounts of blood.

The microcirculatory processes facilitate the delivery of newly oxygenated blood to the affected regions of the hosts prior to the reinstatement of regular circulation. **Table 2** displays the primary components present in the saliva of leeches.

**Table No.2 Composition of Leech Saliva**

No.	Constituent	Function
1	Acetylcholine	Vasodilator
2	Bdellins	Anti-inflammatory, inhibits plasmin, trypsin, and acrosin
3	Calin	Inhibits blood coagulation by blocking the binding of Von Willebrand factor to collagen; inhibits collagen mediated platelet aggregation
4	Carboxypeptidase-A	Increase the inflow of blood at the bite site of inhibitors
5	Destabilase	Monomerizing activity; dissolves fibrin
6	Eglins	Anti-inflammatory; inhibits the activity of $\alpha$ -chymotrypsin chymase, subtilisin, elastase, and cathepsin G
7	Factor Xa inhibitor	Inhibits the activity of coagulation factor Xa by forming equimolar complexes
8	Hirudin	Inhibits blood coagulation by binding to thrombin
9	Hirustatin	Inhibits kallikrein, trypsin, chymotrypsin, and neurophobic cathepsin G
10	Histamine-like	Vasodilator
11	Hyaluronidase	Increases intestinal viscosity and antibiotic action
12	Tryptase inhibitor	Inhibits proteolytic enzymes of host mast cells

## DISCUSSION

The earliest recorded documentation of the utilisation of leeches for medicinal purposes dates back to 200 BC. The practise of *Raktamokshana*, which involves the use of leeches for bloodletting, falls under the category of *Ashastra* as it does not involve the use of cutting instruments. Leech therapy is increasingly being recognised as a highly effective and safe treatment modality, and is attracting growing attention on a global scale. It is widely regarded as a superior form of therapy. Leech saliva comprises diverse bioactive compounds that exhibit vasodilatory, anaesthetic, and analgesic properties. Therefore, it can be inferred that this treatment modality exhibits greater efficacy compared to topical analgesics and anti-inflammatory agents for managing inflammatory and degenerative joint conditions, such as gout and osteoarthritis. The most effective treatment for venous congestion is the utilisation of leeches. This is due to the fact that the small quantities of blood extracted by leeches, coupled with the increased blood removal during the passive-bleeding phase of leech therapy, significantly reduces venous congestion. Furthermore, a diverse array of anticoagulant agents found in the saliva of leeches aid in reducing venous congestion associated with Burger's disease, varicose veins, venous thrombosis, and other related conditions. Leeches have been demonstrated to be effective in treating non-healing ulcers and diabetic foot conditions. The utilization of leeches in the treatment of diverse skin ailments is prevalent due to their *sheetvirya*, as per the principles of Ayurveda, which attributes most skin diseases to the vitiation of *Rakta dosha*.

## Conclusion:

*Jalaukavacharan*, also known as leech therapy, has been found to be beneficial in the treatment of various acute and chronic health conditions. The discussion above suggests that the use of leeches has undergone significant evolution over time. Initially, they were used for bloodletting, but now they are used in a more scientific and physiologically-based manner with clearly defined clinical applications.

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